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NL-2502 LS The Hague (NL).(21) International Application Number: **PCT/NL03/00127**(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
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LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,
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ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI,
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Published:

— with international search report

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11 December 2003*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*(54) Title: **HEDGEHOG-RELATED PROPHYLAXIS, THERAPY AND DIAGNOSIS OF GI TRACT CARCINOGENESIS**

(57) **Abstract:** The present invention is based on the key roles played by Hedgehog proteins in the regulation of homeostasis of the adult intestinal epithelium. Ihh is expressed in the adult mammalian colon and provides a lineage-instructive signal and regulates colonic epithelial morphogenesis in a compartmental fashion. Loss of Ihh expression precedes morphological change in colon tumorigenesis, i.e. carcinogenesis, and Ihh was absent in HT-29 colon carcinoma cells. Treatment of cancerous HT-29 cells with exogenous Hedgehog protein restored their differentiation. Ihh thus plays a pivotal role in the maintenance of colonic epithelial homeostasis in the differentiation of the GI tract cells and is essential for the enrolment of these GI tract cells on the Death program thus maintaining homeostasis to avoid or treat carcinogenesis. In addition, in gastric cancer expression of Shh is lost and loss of Shh expression precedes morphological changes in the parietal cells of the stomach. Shh is specifically expressed in fundic glands as well as in gastric heterotopia in the esophagus in Meckel's diverticulum. Shh thus has a unique role as a morphogen in fundic gland homeostasis. The present invention relates to methods in which a source of Hedgehog proteins is used prophylactically or therapeutically to maintain homeostasis of the adult intestinal epithelium. In particular the invention relates to methods whereby sources of Hedgehog protein are used to prevent or treat carcinogenesis in adult gastric and colonic tissues. The invention also relates to Hedgehog-based method of diagnosing susceptibility for or the presence of carcinogenesis in the adult GI tract, particularly in gastric and colonic tissues. The invention further provides for compositions to be used in the Hedgehog-based methods of diagnosing, preventing and treating epithelial tumorigenesis in the adult GI tract.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K38/00 G01N33/68 C12Q1/68 C12N1/21 A61P35/00
A61K38/17

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12Q C07K A61K G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, WPI Data, PAJ, MEDLINE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 20298 A (ONTOGENY INC) 29 Apr11 1999 (1999-04-29)	1,6, 10-16, 21,28,29 1-29
Y	page 4, line 5 - line 18 page 5, line 5 - line 8 page 8, line 26 - line 28 page 20, line 4 - line 15 page 39, line 21 - line 23	
X	US 6 271 363 B1 (INGHAM PHILIP W ET AL) 7 August 2001 (2001-08-07) *summary*	14-16,21
Y	WO 01 98344 A (BIOGEN INC ;LING LEONA E (US); SANICOLA NADEL MICHELE (US)) 27 December 2001 (2001-12-27) page 102, line 21 - line 23 page 104, line 16 - line 18; example 7	1-29



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

2 September 2003

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Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Although claims 1-13 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☒ Claims Nos.: 1-24 all partially
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1-24 all partially

The claims 1-24 lack clarity because the terms "source" and "suffering from deficiency", or "a deficiency of a hedgehog protein" are unclear and leave the reader in doubt as to the meaning of the technical feature to which they refer, thereby rendering the definition of the subject-matter of said claims unclear (Article 6 PCT). This lack of clarity in the present case is such as to render a meaningful search over the whole of the claimed scope impossible. Consequently, the search has been carried out for those parts of the claims which appear to be clear, supported and disclosed, namely the use of Hedgehog protein in relation to the therapeutic applications specified in claims 2-5, 8-9, 17-20, 23-24, i.e. carcinogenesis in the GI tract, gastric or colonic cancer, colonic adenomatous polyps, GI tract tumorigenesis, gastro intestinal tract carcinoma, invasive adenocarcinoma, small intestinal adenomas, small intestinal cancer, and desmoid tumors.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9920298	A	29-04-1999	US 2002151460 A1	17-10-2002
			AU 760939 B2	22-05-2003
			AU 1108999 A	10-05-1999
			CA 2307322 A1	29-04-1999
			CN 1306436 T	01-08-2001
			EP 1028741 A1	23-08-2000
			JP 2001520202 T	30-10-2001
			WO 9920298 A1	29-04-1999
			US 2003104970 A1	05-06-2003
US 6271363	B1	07-08-2001	US 5844079 A	01-12-1998
			US 5789543 A	04-08-1998
			US 6607913 B1	19-08-2003
			US 6261786 B1	17-07-2001
			US 2003054437 A1	20-03-2003
			US 6384192 B1	07-05-2002
			US 6165747 A	26-12-2000
			US 6576237 B1	10-06-2003
			AU 704178 B2	15-04-1999
			AU 1520795 A	01-08-1995
			AU 736492 B2	26-07-2001
			AU 1645199 A	27-05-1999
			CA 2179029 A1	13-07-1995
			EP 0741783 A1	13-11-1996
			JP 9507853 T	12-08-1997
			NZ 278765 A	27-05-1998
			NZ 500010 A	27-07-2001
			WO 9518856 A1	13-07-1995
WO 0198344	A	27-12-2001	AU 7549501 A	02-01-2002
			CA 2412215 A1	27-12-2001
			EP 1294752 A2	26-03-2003
			WO 0198344 A2	27-12-2001
			US 6552016 B1	22-04-2003
			US 2003022819 A1	30-01-2003